A 22-year-old man with a history of a Ross procedure underwent successful transcatheter pulmonary valve replacement with a 26-mm Edwards SAPIEN valve (Edwards Lifesciences LLC, Irvine, CA) for progressive conduit dysfunction. The homograft (27 mm), placed 5 years previously, was heavily calcified with a minimum diameter of 9 mm. After demonstration of remote coronary artery position confirmed with a 24-mm Amplatz sizing balloon (St Jude Medical, St Paul, MN), prestenenting was performed with 2 P4010 stents (Cordis Corporation, Miami Lakes, FL), the first of which was covered along its entire length with expandable polytetrafluoroethylene. With wire position in the left pulmonary artery, the initial stent was mounted on an 18-mm BiB catheter (NuMed Inc, Hopkinton, NY) with postdilation with a 22-mm Atlas balloon (Bard Peripheral Vascular Inc, Tempe, AZ) to 12 atm. The second stent delivered because of recoil of the first was deployed on a 22-mm BiB with postdilation with a 24-mm Atlas (12 atm). The 26-mm valve was deployed with a 30-mm-long balloon inflated to 5 atm after delivery with a 24 Fr Retroflex system (Edwards Lifesciences LLC). Postvalve deployment pulmonary angiography demonstrated neovascular competence with no aneurysm of the conduit seen. Angulated ascending aortography performed routinely in our practice to assess gross coronary artery filling postvalve deployment did not identify any filling of the pulmonary arteries. Final mean pulmonary artery pressure after valve deployment was 17 mm Hg. Intracardiac echocardiography demonstrated no pulmonary incompetence with no abnormal diastolic flow seen into the main pulmonary artery (MPA). Predischarge transthoracic echocardiogram revealed a mean gradient of 12 mm Hg, and no flow was seen from the aorta into the MPA.

The patient was reviewed electively 8 weeks after the procedure. He was asymptomatic; however, clinical examination revealed a new grade II continuous murmur along the upper left sternal edge. Transthoracic echocardiogram demonstrated excellent SAPIEN valve function; however, there was a small continuous jet into the MPA seen at the distal aspect of the stent complex not seen on comparable views in the postprocedural transthoracic echocardiogram. Further evaluation with computed tomography demonstrated a small aortopulmonary fistula from the ascending aorta at the branching point of the MPA into the right pulmonary artery (Figure A and B). Eight weeks later, the patient underwent successful transcatheter closure of the aortopulmonary fistula with a 6-mm Amplatz Vascular Plug IV (St Jude Medical). This device was chosen to minimize any impingement on the SAPIEN valve. Initial hemodynamic assessment before device deployment revealed a Qp:Qs of 1.3:1, and aortogram confirmed the leak (Figure C). The defect was subsequently crossed from the ascending aorta with creation of an arteriovenous loop and balloon sizing (fistula diameter, 3.5 mm) from the femoral venous side with transesophageal echocardiographic guidance (Figure D). An arteriovenous loop was chosen to provide greater stability with balloon sizing and also to extend options for device choice before closure. Device assessment confirmed the cone of the device distal to the sinotubular junction and left coronary artery. Complete closure after device release was confirmed at the end of the case (Figure E and F). The patient recovered well and was discharged home with continuation of his oral aspirin. Subsequent 3-month follow-up transthoracic echocardiogram has confirmed closure.

Surgical management of an aortopulmonary fistula has been previously reported after transcatheter pulmonary valve replacement with a Melody valve (Medtronic Inc, Minneapolis, MN). Interestingly, this also occurred in a patient with a previous Ross procedure with initial assessment failing to identify the cause for postvalve implantation acute heart failure. Etiologic mechanisms in this case include acute trauma to the homograft in the setting of aggressive balloon dilation, as reported with patients undergoing balloon dilation of supravalvar pulmonary stenosis after arterial switch operation.3,4 Aneurysm formation, secondary to balloon dilation of the MPA distal to the covered stent, may have precipitated contact with the ascending aorta along old suture lines and subsequent fistula formation. Indeed, the use of a covered stent in this setting will not effectively mitigate against distal balloon-induced vessel trauma, and this should be evaluated effectively with repeat postvalve deployment pulmonary artery angiography, hemodynamics, and echocardiography. It is less likely that expanding the MPA with a rigid stent toward a slightly dilated ascending aorta may have precipitated contact and subsequent erosion as the fistula was several millimeters distal to the stents. However, as experience with transcatheter pulmonary valve implantation broadens, appreciation of evolving unexpected complications is essential to

Correspondence to Damien Kenny, MB, MD, Rush Center for Congenital and Structural Heart Disease, Jones 770, Rush University Medical Center, 1653 W Congress Pkwy, Chicago, IL 60612. E-mail damien_kenny@rush.edu

*Circ Cardiovasc Interv* is available at http://circinterventions.ahajournals.org

DOI: 10.1161/CIRCINTERVENTIONS.113.000654
ensure appropriate postvalve deployment assessment and subsequent postprocedural monitoring.

**Disclosures**

Dr Hijazi works as a nonpaid consultant for Edwards Lifesciences. The other authors report no conflicts.

**References**

1. Taggart NW, Hagler DJ, Connolly HM. Melody valve erosion into the ascending aorta. *Congenit Heart Dis*. 2013;8:E64.


**Key Words:** device closure ▪ fistula ▪ pulmonary valve ▪ transcatheter

---

**Figure.**

A, Computed tomography (CT) angiogram in the axial plane demonstrating the aortopulmonary connection (white arrow) entering the main pulmonary artery above the stent complex at the junction of the main pulmonary artery with the right pulmonary artery. **B,** CT angiogram in the parasagittal view demonstrating the aortopulmonary connection (white arrow). **C,** Initial aortogram in the straight lateral view demonstrating the stented pulmonary outflow with the SAPIEN valve, the slightly dilated ascending aorta, and the posterior fistula into the distal main pulmonary artery (leak). **D,** Transesophageal echocardiography demonstrating short-axis view of the ascending aorta (AAO) with color Doppler assessment demonstrating leak into the pulmonary artery (white arrow). **E,** Final aortogram after device release demonstrating the device in a good position with no further leak. **F,** Three-dimensional transesophageal echocardiography demonstrating the deployed AVP IV across the fistula.
Aortopulmonary Fistula After Transcatheter Pulmonary Valve Replacement
Damien Kenny, Noa Holoshitz, David Turner and Ziyad M. Hijazi

Circ Cardiovasc Interv. 2013;6:e67-e68
doi: 10.1161/CIRCINTERVENTIONS.113.000654
Circulation: Cardiovascular Interventions is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2013 American Heart Association, Inc. All rights reserved.
Print ISSN: 1941-7640. Online ISSN: 1941-7632

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circinterventions.ahajournals.org/content/6/6/e67

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation: Cardiovascular Interventions can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at: http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation: Cardiovascular Interventions is online at: http://circinterventions.ahajournals.org//subscriptions/